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Response to RFC 567 — Cross-Country Network Bandwidth

This note serves as a brief correction to several fundamental errors in RFC 567 by L. Peter Deutsch.

1. Not all packets are 1000 bits long. This is basic to the network design.

2. RFNMs are 152 bits long (72 bits of hardware framing and 80 bits of software identification and addressing). Host Host protocol messages such as single-characters and allocates are 216 bits long (40 bits of Host protocol, 8 bits for the character or ALL, and an additional 16 bits of IMP software header). This totals to 736 bits in each direction, not 4000.

3. The number of single-character messages that can be supported is therefore over 200 per second, not 37.5 per second. Not only is such a traffic pattern unlikely, but it can be supported in the IMP subnetwork much more readily than in most Hosts.

4. Furthermore, if the demand for remote echoing ever exceeds network capacity, the TIPs and Hosts can simply buffer 2 characters per message, doubling the effective bandwidth of the network. Of course, dozens of characters can be packed into a single message with nearly proportional increases in effective bandwidth, given the size of the overhead. This buffering happens automatically and incrementally with increasing load as the natural consequence of slowed responses.

5. It is most likely that the poor echoing response cited by Deutsch is not caused by peak network loads. If echoing was coming in 5-character bursts, there would have to be 1000 characters per second coming from users of remote-echo systems to use all the capacity of 3 50-kilobit paths.

6. This reasoning points up the more serious error in RFC 567: the problems associated with bad echo response are delay problems, not bandwidth. In designing the IMP software, we have used a bimodal model of traffic, and attempted to provide low delay for interactive traffic, and high throughput rates for bulk data transfers. It is pointless to try for high data rates with short messages — the overhead in bits, and also in IMP and Host processor wake-ups, is too high. The primary factor in echoing performance is delay. As an extreme example, echoing over a megabit per second satellite link will lag a second or more behind input, with no bandwidth limitations at all.

7. We agree that changes to TELNET protocol may well improve performance by reducing network traffic, and, more importantly, reducing demands for Host processing. In cases of network paths with long delay, especially satellite links, such changes are essential for interactive echoing.

JMcQ/jm